Chapter 7 Polynomial Functions

7-1 Polynomial Functions

ex

$7z^3 - 4z^2 + z$

Degree? 3 (In one variable)

Leading coefficient? 7

ex

$9y - 3y^2 + 4y^4$

Degree? 4

Leading coefficient? 4

ex

$3c^2 + 4c - 2c^{-1}$

Degree? Not polynomial

Leading coefficient?

$f(x) = 3x^2 - 3x + 1$

$f(4) = 3(4)^2 - 3(4) + 1$

$f(4) = 37$

$f(-2) = 3(-2)^2 - 3(-2) + 1$

$= 12 + 6 + 1$

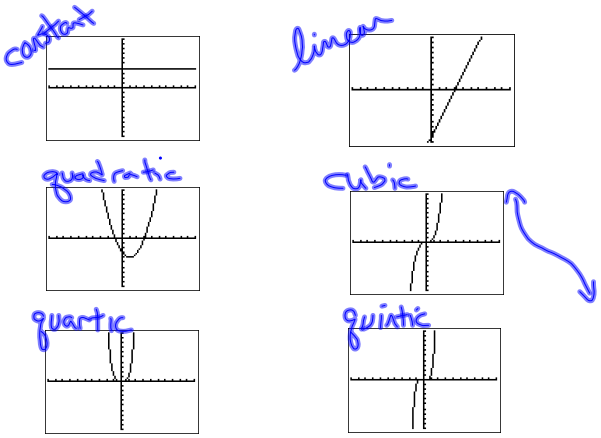
$= 19$

$p(x) = 2x^4 - x^3 + 3x$

$p(y^3) = 2(y^3)^4 - (y^3)^3 + 3(y^3)$

$= 2y^{12} - y^9 + 3y^3$

Graphs of functions		Degree
Constant	$f(x) = 4$	0
Linear	$f(x) = 3x - 9$	1
Quadratic	$f(x) = x^2 - 2x - 3$	2
Cubic	$f(x) = x^3$	3
Quartic	$f(x) = x^4$	4
Quintic	$f(x) = x^5$	5



Let's look at the end behavior.

End Behavior--behavior of graph as x approaches $+\infty$ and $-\infty$

even degree → end behavior is the same

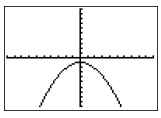
odd degree → end behavior is opposite

Determined by degree and leading coefficient

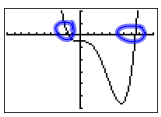
Summary

Even	Odd	Even	Odd
+	+	-	-
As $x \to +\infty$, $f(x) \to +\infty$	As $x \to +\infty$, $f(x) \to +\infty$	$+\infty$	As $x \to +\infty$, $f(x) \to -\infty$
As $x \to -\infty$, $f(x) \to +\infty$	As $x \to -\infty$, $f(x) \to -\infty$	$-\infty$	As $x \to -\infty$, $f(x) \to +\infty$

Examples
a. Describe the end behavior.
b. Is the function odd or even?
c. State the number of zeros.

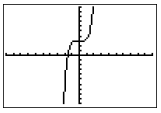


a. As $x \to +\infty$, then $f(x) \to -\infty$
As $x \to -\infty$, then $f(x) \to -\infty$
b. even
c. 0

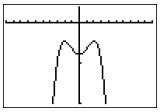


a. As $x \to +\infty$, then $f(x) \to +\infty$
As $x \to -\infty$, then $f(x) \to +\infty$
b. even
c. 2

Examples
a. Describe the end behavior.
b. Is the function odd or even?
c. State the number of zeros.



a. As x $\longrightarrow +\infty$, then f(x) $\longrightarrow +\infty$
b. As x $\longrightarrow -\infty$, then f(x) $\longrightarrow -\infty$
c. odd
1



a. As x $\longrightarrow +\infty$, then f(x) $\longrightarrow -\infty$
b. As x $\longrightarrow -\infty$, then f(x) $\longrightarrow -\infty$
c. even
0

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HW
p350-351
16-21, 30, 34, 39-44